

MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
Bldg. 202 Rm. 211
Gaithersburg, Maryland 20899-2322

SRM Number: 931f
MSDS Number: 931f
SRM Name: Liquid Absorbance Standard
for Ultraviolet and Visible Spectrophotometry
Date of Issue: February 4, 1999

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SECTION I. MATERIAL IDENTIFICATION

Material Name: Liquid Absorbance Standard for Ultraviolet and Visible Spectrophotometry

Description: SRM 931f consists of three sets of three cobalt-nickel solutions (liquid filters) and one set of three blank solutions (12 ampoules total). Approximately 10 mL of liquid is individually flame-sealed in each glass ampoule which has been prescored for easy opening. Each set of 12 ampoules is packaged in a tray.

Other Designations: Cobalt and Nickel in Perchloric Acid (dioxonium perchlorate; perchlorate solution; hydronium perchlorate) and Nitric Acid (aqua fortis; hydrogen nitrate; azotic acid; engravers acid)

Name	Chemical Formulas	CAS Registration Number
Perchloric Acid	HClO ₄	7601-90-3
Nitric Acid	HNO ₃	7697-37-2
Cobalt	Co	7440-48-4
Nickel	Ni	7440-45-9

DOT Classification: Corrosive, Liquid, N.O.S., UN1760

Manufacturer/Supplier: Available from a number of suppliers.

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration	Exposure Limits and Toxicity Data
Perchloric Acid	Level I: 25 mL/L Level II: 24 mL/L Level III: 62.5 mL/L Blank: 9 mL/L	No TLV-TWA established Rat, Oral: LD ₅₀ : 1100 mg/kg Mouse, Subcutaneous: LD ₅₀ : 250 mg/kg Dog, Oral: LD ₅₀ : 400 mg/kg
Nitric Acid	Level I: 15 mL/L Level II: 22.5 mL/L Level III: 32.5 mL/L	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m ³ OSHA TLV-TWA: 2 mg/kg or 5 mg/m ³ Human, Oral: LD _{LO} : 430 mg/kg
Cobalt	Level I: 3.7 g/L Level II: 7.4 g/L Level III: 11.1 g/L	ACGIH TLV-TWA: 0.02 mg/m ³ OSHA TLV-TWA: 0.1 mg/m ³ Rat, Oral: LD ₅₀ : 6171 mg/kg Rat, Intraperitoneal: LD ₅₀ : 100 mg/kg
Nickel	Level I: 3.5 g/L Level II: 7 g/L Level III: 10.4 g/L	OSHA TLV-TWA: 1 mg/m ³ Rat, Intraperitoneal: LD ₅₀ : 250 mg/kg Rat, Oral: LD _{LO} : 5 mg/kg

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Perchloric Acid	Nitric Acid
Appearance and Odor: An odorless, colorless, hygroscopic liquid	Appearance and Odor: A white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light
Relative Molecular Mass: 100.46	Relative Molecular Mass: 63.01
Density (@ 22 °C): 1.764	Density: 1.0543 (10 % nitric acid)
Solubility in Water: Soluble	Solubility in Water: Soluble
Solvent Solubility: Not Available	Solvent Solubility: Decomposes in alcohol

Cobalt	Nickel
Appearance and Odor: A white to gray, odorless solid	Appearance and Odor: A lustrous white to grey crystal or powder
Relative Molecular Mass: 58.93	Relative Atomic Mass: 58.69
Density: 8.92	Density: 8.90
Solubility in Water: Insoluble	Solubility in Water: Insoluble
Solvent Solubility: Soluble in dilute nitric acid, hydrochloric acid and sulfuric acid	Solvent Solubility: Soluble in dilute nitric acid

Note: The physical and chemical data provided are for the pure components. Physical and chemical data for this nickel-cobalt/perchloric acid-nitric acid solution do not exist. The actual behavior of the solution may differ from the individual components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A

Method Used: N/A

Autoignition Temperature: N/A

Flammability Limits in Air (Volume %): **UPPER:** N/A
LOWER: N/A

Unusual Fire and Explosion Hazards: Although perchloric acid and nitric acid do not burn, they are powerful oxidizing agents that can react with combustible materials to cause fires. Nickel and cobalt are negligible fire hazards when exposed to heat or flames.

Extinguishing Media: Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and perchloric acid and to absorb liberated oxides of nitrogen.

Special Fire Procedures: Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

SECTION V. REACTIVITY DATA

Stability: X Stable Unstable

Conditions to Avoid: Avoid contact with incompatible materials.

Incompatibility (Materials to Avoid): Keep nitric acid away from organic materials, plastics, rubber, and some forms of coatings. Nitric acid is incompatible with chlorine and metal ferrocyanide. Perchloric acid is incompatible with certain acids, combustible materials, metals, oxidizing agents, metal oxides, halo carbons, halogens, metal salts, and bases. Cobalt is incompatible with combustible materials, certain acids, oxidizing materials, and halogens. Nickel is incompatible with certain acids, metals, bases, oxidizing materials, halogens, reducing agents, and combustible materials.

See Section IV: *Unusual Fire and Explosion Hazards*.

Hazardous Polymerization: _____ **Will Occur** _____ **X** **Will Not Occur**

Route of Entry: X Inhalation X Skin X Ingestion

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be taken in Case Material is Released or Spilled: Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

Waste Disposal: Follow all federal, state, and local laws governing disposal.

Handling and Storage: Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water.

Note: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Nickel*, September 10, 1998.
MDL Information Systems, Inc., MSDS *Cobalt*, September 10, 1998.
MDL Information Systems, Inc., MSDS *Nitric Acid*, March 12, 1998.
MDL Information Systems, Inc., MSDS *Perchloric Acid*, September 10, 1998.
Hawley's Condensed Chemical Dictionary, 11th Ed., 1987.
The American Heritage: Stedman's Medical Dictionary, 1995.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given on the NIST Certificate of Analysis.